



Online Systems Tutorial

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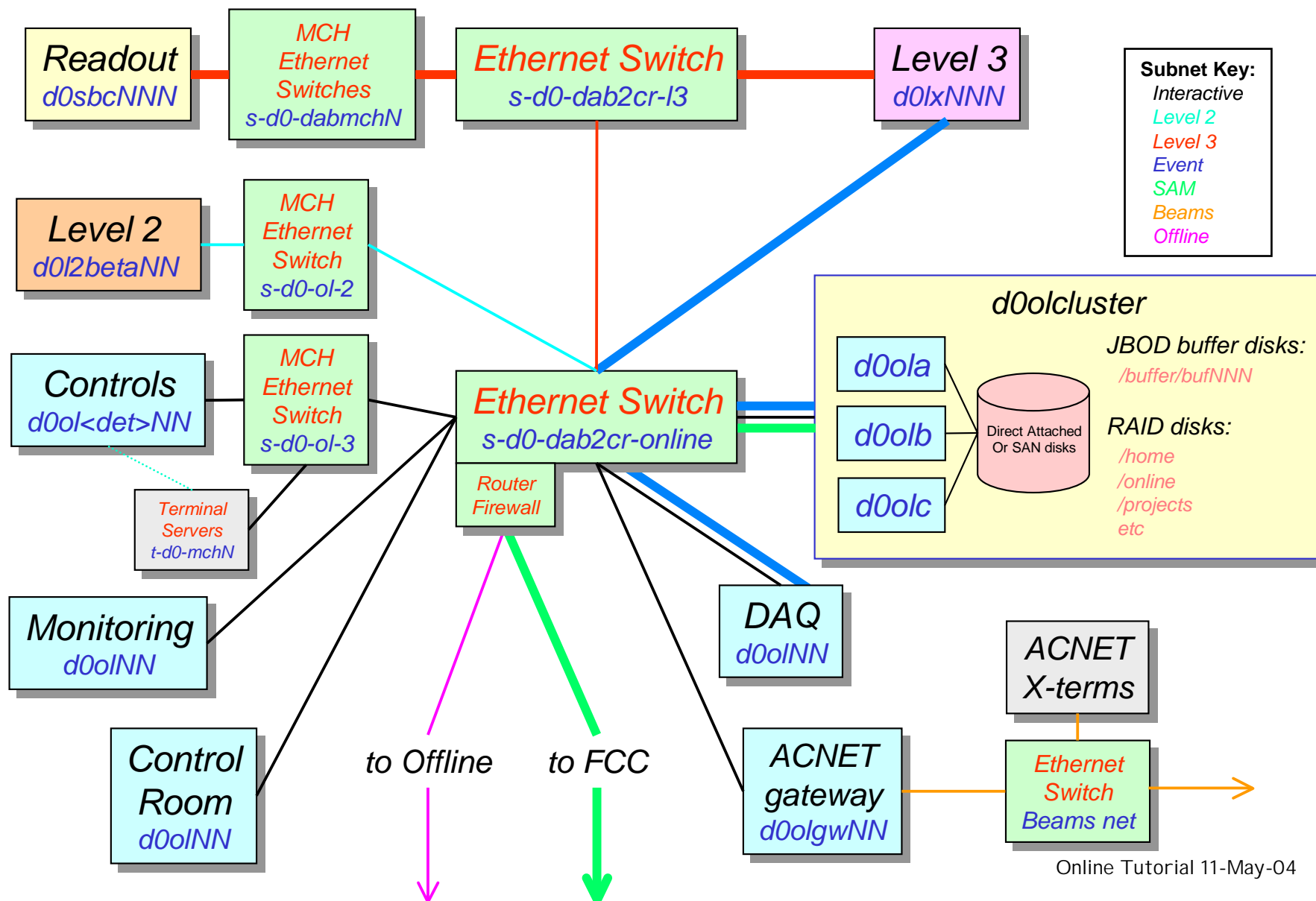


Online Functions

- Infrastructure
 - ◆ Network
 - ◆ Storage systems
 - ▲ Network file system (NFS)
 - ◆ User information
 - ▲ NIS / yp
 - ◆ Backup system
 - ▲ BRU
- Control Room
 - ◆ User environment
- Monitoring
 - ◆ Examine platforms
- Event Data path
 - ◆ From Level 3 to FCC
 - ◆ Including event metadata
- Control System
 - ◆ Hardware monitoring
 - ▲ EPICS
 - ◆ “SDAQ”
 - ▲ Alternative readout path
- ORACLE Database
 - ◆ Primarily “pass through”, with data propagated to Offline database

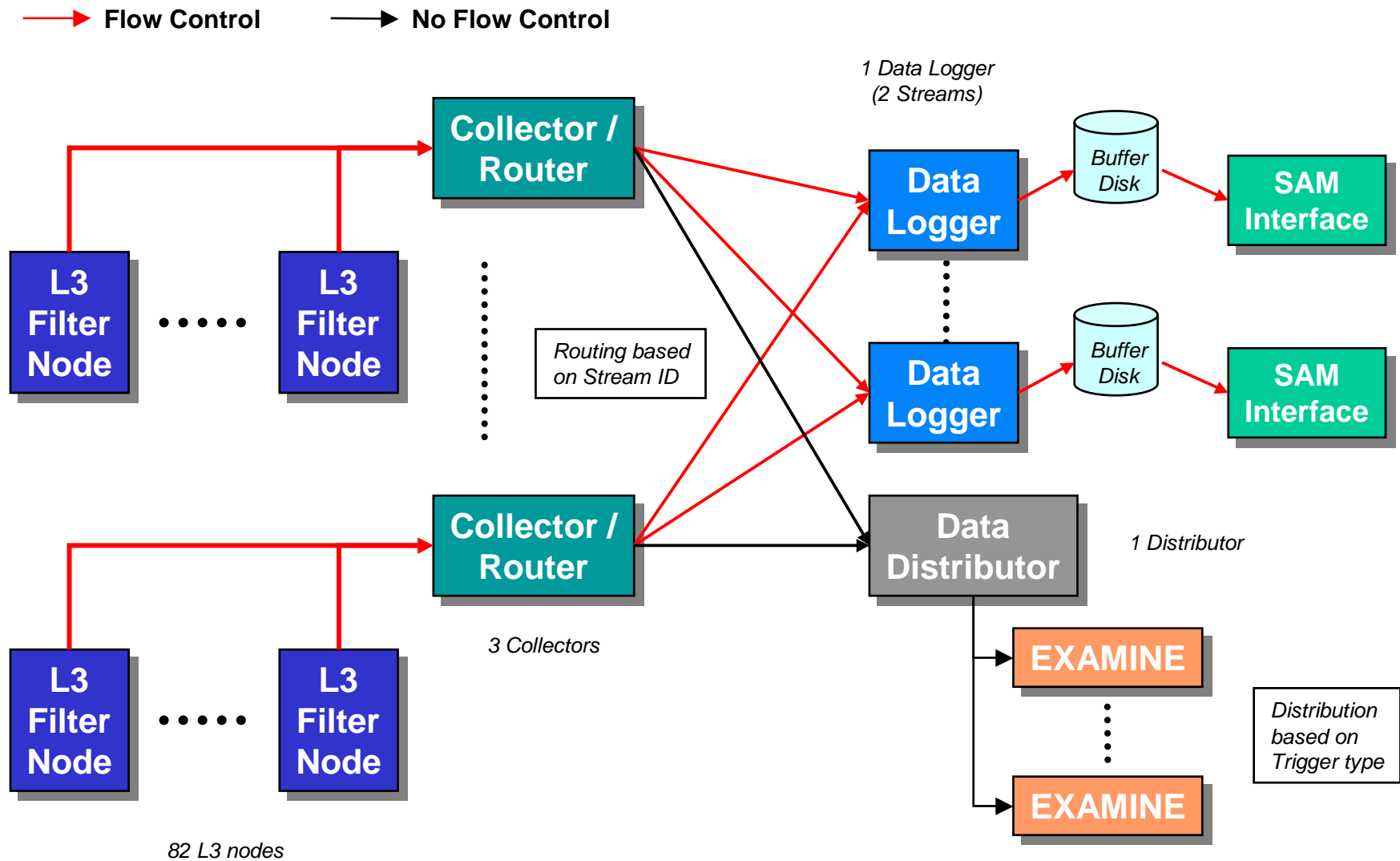


Online network view





Event Data Flow





Assignments

- Application / service assignments kept at

/online/data/d0online_names/d0online_names.py

If a node dies and the application is relocated, this file must be edited and the instructions within followed

- Node assignments

http://www-d0online.fnal.gov/www/sys/operations/node_assignments.txt

http://www-d0online.fnal.gov/www/sys/operations/group_assignments.txt

- Disk assignments

http://www-d0online.fnal.gov/www/sys/operations/disk_assignments.txt



Accounts

- Two important factors:
 - ◆ Authorization – that an account is present for a user on a node
 - ▲ Granted to any DO user with need
 - Access to group account may be sufficient
 - Check with “ypcat passwd” or “ls /home”
 - A null `/home/<user>/.k5login` file indicates the account is locked out!
 - ◆ Authentication – that one can demonstrate knowledge of a password
 - ▲ The only allowed mode of access originating from outside of the Online system is by Kerberos
 - Almost... there are some Windows nodes with very restricted external access



Accounts

- On the “interactive” (Control Room, Monitoring, Host) systems
 - ◆ Authorization
 - ▲ Local accounts (e.g. root) for system use only
 - ▲ NIS accounts for personal and group users
 - NIS domain server is d0olcluster
 - Personal accounts are “locked out” from non-Kerberos authentication
 - ◆ Authentication
 - ▲ Only root account has a local password
 - Kerberos .k5login access for remote logins
 - Personal Kerberos credentials (i.e. user@FNAL.GOV)
 - ▲ Group NIS accounts
 - NIS password only for local logins
 - Kerberos .k5login access for remote logins
 - Personal Kerberos credentials (i.e. user@FNAL.GOV)
 - Keytab Kerberos credentials (i.e. d0cap/d0/d0ol04.fnal.gov@FNAL.GOV)
 - ▲ Personal NIS accounts
 - Kerberos password for local logins (on most nodes)
 - Kerberos or .k5login access for remote logins
 - If a .k5login exists, then must include own credentials



Accounts

- On the “DAQ” (Readout, Level 2, Level 3) systems
 - ◆ Authorization
 - ▲ Local accounts for system, DAQ, and expert users
 - ◆ Authentication
 - ▲ Only root account has (should have) a local password
 - Kerberos .k5login access for remote logins
 - Personal Kerberos credentials (i.e. user@FNAL.GOV)
 - ▲ DAQ local accounts
 - Kerberos .k5login access for remote logins
 - Personal Kerberos credentials (i.e. user@FNAL.GOV)
 - Keytab Kerberos credentials (i.e. d0run/d0/d0ol07.fnal.gov@FNAL.GOV)
 - ▲ Expert user local accounts
 - Kerberos or .k5login access for remote logins
 - Personal Kerberos credentials (i.e. user@FNAL.GOV)



Accounts

- On the Controls systems
 - ◆ Authorization
 - ▲ Local accounts for expert users
 - ◆ Authentication
 - ▲ Expert user local accounts
 - Local password for local login
 - ▲ No Kerberos! Remote logins are not allowed, and blocked by Online router



Accounts

- Some useful commands
 - ◆ To check group account access, e.g.
`cat /home/d0cap/.k5login`
 - ◆ To see if a user has an NIS account, e.g.
`ypcat passwd | grep fuess`
 - ◆ To remotely log in to group account on an Online node, e.g.
`kinit fuess`
`ssh -l d0cap d0ol04`
 - ◆ To log in to another node from a group account, e.g. as d0run
`setup d0online`
`d0ssh -l d0cap d0ol04`



Accounts

- Kerberos keytab files

How does this work?

```
setup d0online  
d0ssh -l d0cap d0ol04
```

On each node there is a specific (perhaps empty) set of files of the sort

```
/var/adm/krb5/d0smt_keytab
```

accessible only by the named user

These contain the Kerberos key which allows the specific group (e.g. d0smt) account on that node (e.g. d0ol44) to obtain a principal which is of the form

```
d0smt/d0/d0ol44.fnal.gov@FNAL.gov
```

This principal is then listed within the `.k5login` of any account for which access is needed

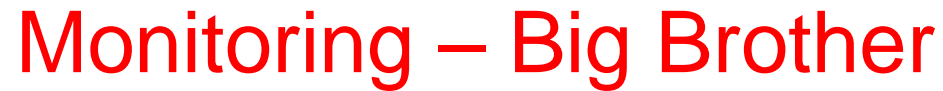
The d0ssh script is only 2 lines: `kinit` and `ssh`



Access controls

- Essential components of the computer security plan for the Online system are that:
 - ◆ The detector can operate with the Online system completely isolated from the external world
 - ▲ Well-defined isolation points
 - ▲ Can isolate from Offline, FCC, or both
 - ▲ Local versions of essential services
 - DNS server
 - KDC
 - ▲ Sufficient space to buffer event data for > 24 hours
 - ◆ Network access to the Online system is tightly controlled
 - ▲ Enforced by router module in Online switch acting as a “firewall”
 - ▲ Policy is “default deny”

All this leads to functional limitations and operational confusion...

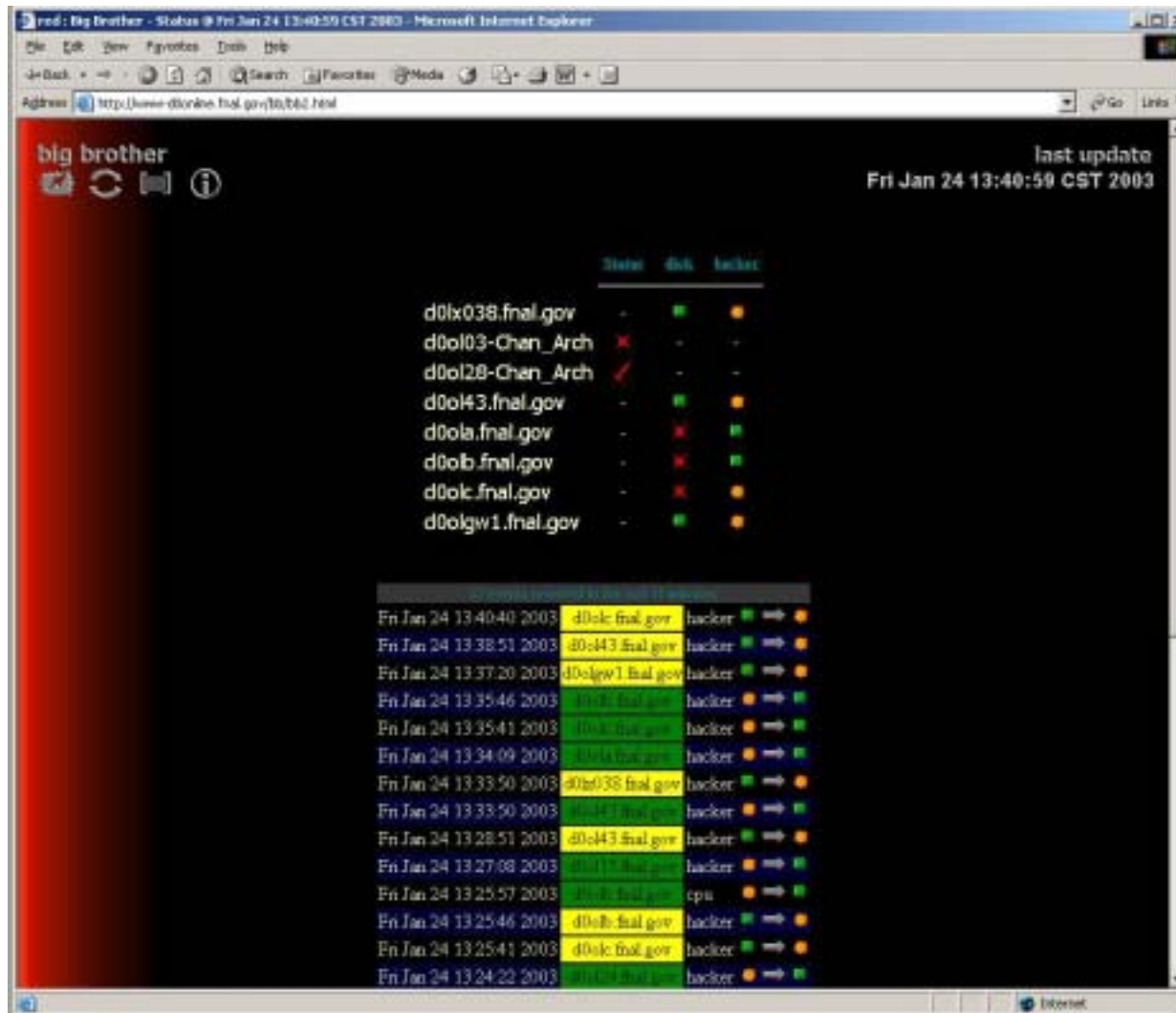


<http://www-d0online/bb>




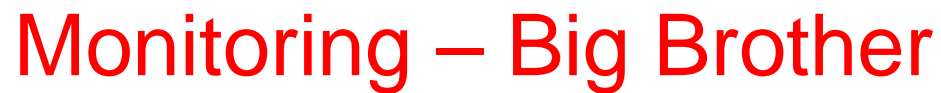


Monitoring – Big Brother



Summary display

click  button



green: Big Brother - larrr status for d00k.fnal.gov (131.225.231.62) * Fri Jan 24 09:09:30 2003

File Edit View Favorites Tools Help

Back Forward Stop Search Favorites Media

Address <http://www.d00k.fnal.gov/cgi-bin/lb-testsw.sh?HOSTSW=d00k.fnal.gov.larrr> Go Links

big brother

last update
Fri Jan 24 09:09:30 2003

d00k.fnal.gov - larrr

green Fri Jan 24 09:09:30 CST 2003 - larrr is accumulating

Load Average Last 48 Hours

Load Average

Current: 0.6
Min: 0.4
Average: 0.7
Max: 2.2
Fri Jan 24 09:12:07 2003

d00k.fnal.gov Disk Utilization Last 48 Hours

% Free





Monitoring – Big Brother

green: Big Brother - topp status for d0o107.fnal.gov (131.225.231.77) @ Fri Jan 24 09:17:12 2003 - Microsoft Internet Explorer

Address: <http://www.d0online.fnal.gov/topp-bin/bb-hostsvr.sh?HOSTNAME=d0o107.fnal.gov,topp>

big brother

last update
Fri Jan 24 09:17:12 2003

Big Brother **topp** display

d0o107.fnal.gov - topp

green Fri Jan 24 09:17:12 CST 2003

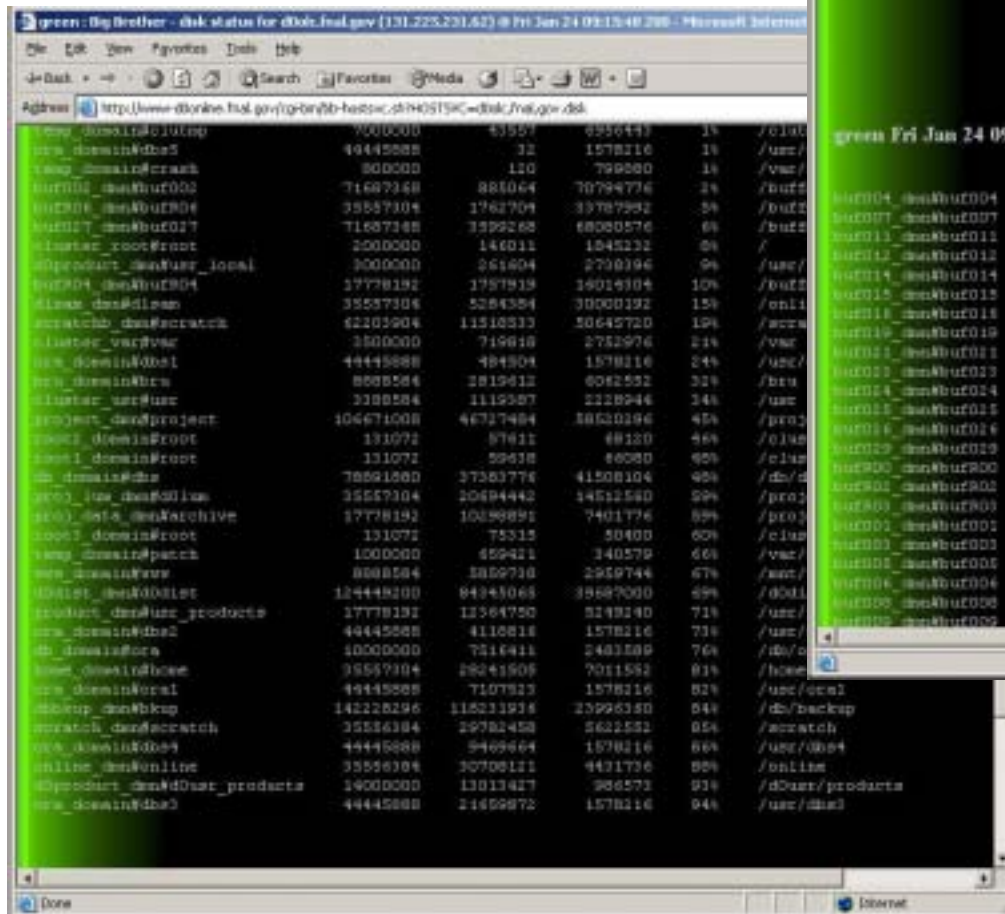
%CPU	ELAPSED	RSS	%MEM	PID	USER	COMMAND
80.5	00:00	1056	0.2	21262	root	egrep -v -f /usr/local/etc/logcheck.ignore /usr/local/etc/tmp/check.21269
49.7	14:17:34	17312	1.9	14845	d0run	/usr/lib/netscape/netscape-communicator -irix-session-management
9.8	2-00:45:16	18588	2.0	1259	root	/etc/X11/X -auth /var/gdm/:0.Xauth :0
6.3	1-22:26:02	92252	10.1	2145	d0run	java -jar fuMon.jar -s d013mon.fnal.gov -p 52311 -R
4.0	1-22:26:05	92252	10.1	2136	d0run	java -jar fuMon.jar -s d013mon.fnal.gov -p 52311 -R
3.6	1-22:25:59	92252	10.1	2148	d0run	java -jar fuMon.jar -s d013mon.fnal.gov -p 52311 -R
3.5	1-22:26:05	92252	10.1	2138	d0run	java -jar fuMon.jar -s d013mon.fnal.gov -p 52311 -R
3.4	1-21:40:55	12048	1.3	23751	d0run	./Linux2.4-KCC_4_0-maxopt/l3x qt_display d013mon default
2.2	2-00:18:42	14472	1.6	14890	d0run	python /online/products/l3xtools/onl00-00-03/Linux/lib/L3xMon.py /online/products/
1.7	00:10	1120	0.1	21016	d0lum	/bin/sh /online/data/luminosity/crom/watch.sh
1.6	00:10	1120	0.1	21017	d0lum	/bin/sh /online/data/luminosity/crom/watch.sh
1.1	1-22:26:05	92252	10.1	2137	d0run	java -jar fuMon.jar -s d013mon.fnal.gov -p 52311 -R
1.1	1-20:44:22	22032	2.4	18279	d0run	python /online/products/daq_monitor/onl00-06-02/Linux+2/py/DAQ_Monitor.py 52225 d0
1.0	2-00:18:51	17372	1.9	14411	d0run	python /online/products/daq_monitor/onl00-06-02/Linux+2/py/DAQ_Monitor.py 52225 d0
0.8	00:05	1480	0.1	21286	d0lum	python ./watch.py lnSlave
0.7	09:12:00	16696	1.8	24801	d0run	/online/products/coor/onl00-60-00/Linux/bin/t
0.6	00:05	1480	0.1	21285	d0lum	python ./watch.py lnWatch
0.5	00:08	1020	0.1	21269	root	/bin/sh /usr/local/bb/ext/bb-hakr.sh
0.4	2-00:18:36	17372	1.9	14911	d0run	python /online/products/daq_monitor/onl00-06-02/Linux+2/py/DAQ_Monitor.py 52225 d0
0.4	1-20:44:14	22032	2.4	18285	d0run	python /online/products/daq_monitor/onl00-06-02/Linux+2/py/DAQ_Monitor.py 52225 d0
0.2	2-00:18:50	14472	1.6	14543	d0run	python /online/products/l3xtools/onl00-00-03/Linux/lib/L3xMon.py /online/products/
0.2	13:52:39	6708	0.7	27680	d0lum	python /online/data/luminosity/apps/lnSlave
0.1	2-00:44:39	1312	0.1	2011	d0run	xosview
0.1	2-00:42:16	34644	3.8	4028	d0run	java -jar /projects/eloq/ProcessLogger/LogBookProcessLogger.jar /projects/eloq/CRI

Warning: all BB updates are synchronized, so often report themselves as current major user!

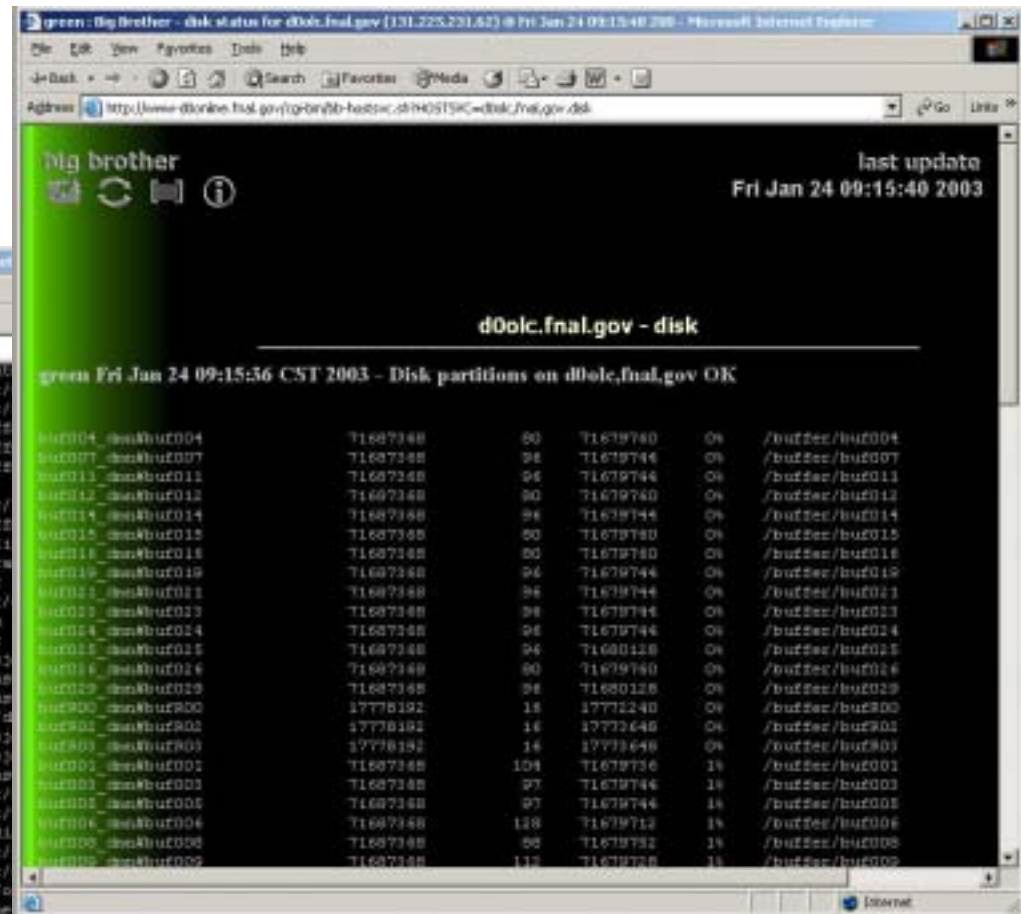


Monitoring – Big Brother

Big Brother **disk** display
Local disk usage
See [d0ola/b/c](#) for cluster disks



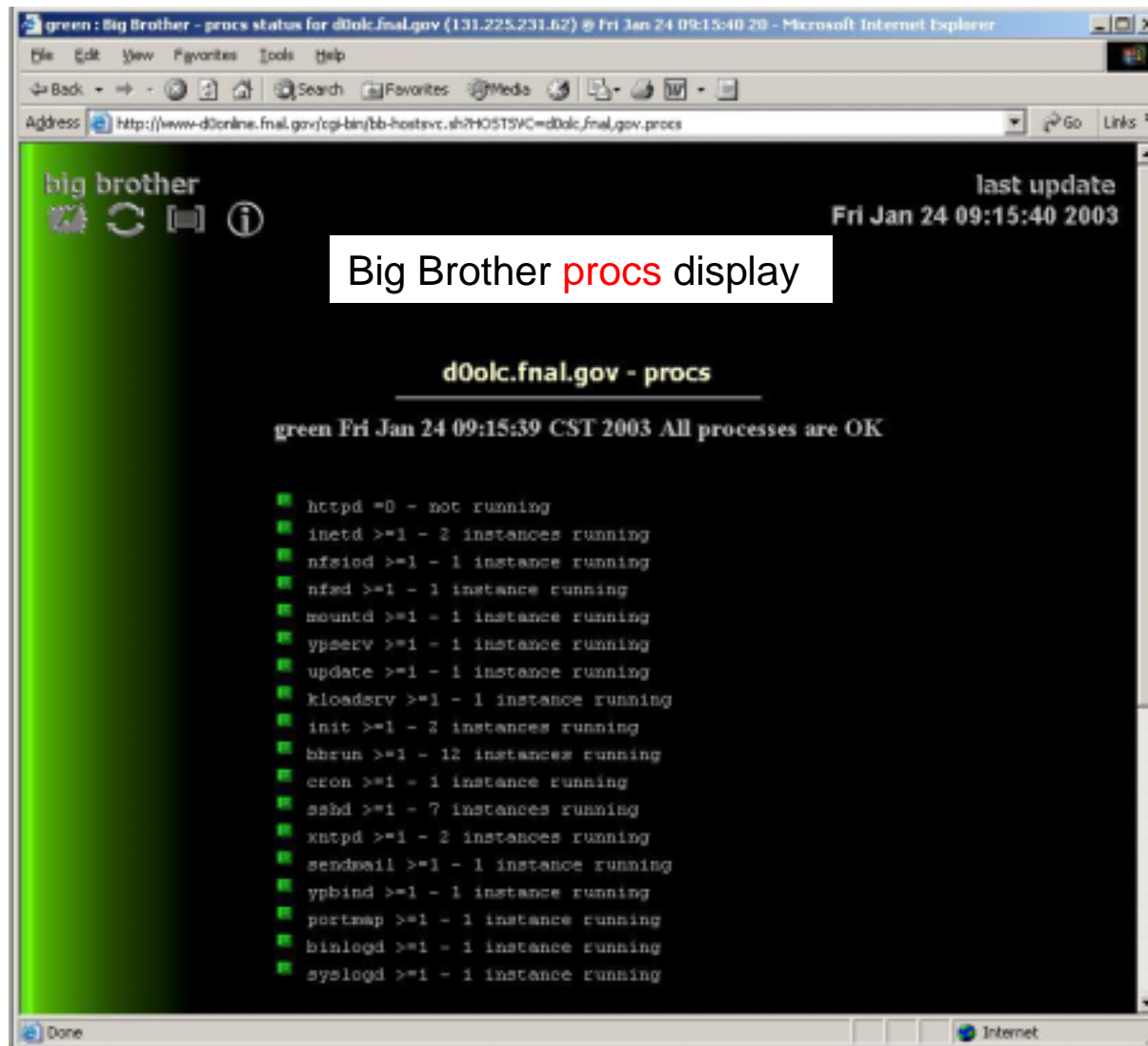
User	Domain	Size	Used	Free	Percent	Mount Point
root	domain#root	1000000	43557	956443	1%	/
www	domain#dbs	44445888	32	1578216	1%	/usr/
www	domain#dbs	800000	110	799890	1%	/var/
bu004	domain#bu004	71687348	881064	70796284	2%	/buffer/bu004
bu007	domain#bu007	35557304	1762704	33794600	5%	/buffer/bu007
bu011	domain#bu011	71687348	359268	68094660	6%	/buffer/bu011
cluster	root#root	2000000	146011	1853989	8%	/
d0product	domain#d0product	3000000	261404	2738596	9%	/usr/
bu004	domain#bu004	17778192	1757819	16020373	10%	/buffer/bu004
d0lc	domain#d0lc	35557304	5284304	30272900	15%	/online
scratch	domain#scratch	42203904	11518533	30685371	19%	/scratch
cluster	var#var	3500000	719016	2780984	21%	/var
www	domain#dbs	44445888	484304	1578216	24%	/usr/
www	domain#dbs	800000	2819612	6082532	32%	/var
cluster	usr#usr	3100584	1119507	2220944	34%	/usr
project	domain#project	104671008	46327484	58343524	45%	/project
root	domain#root	131072	87611	43461	66%	/
root	domain#root	131072	59638	71434	80%	/
db	domain#db	78861000	37583776	41277224	48%	/db
root	domain#root	35557304	20694442	14862862	59%	/project
root	domain#root	17778192	10298891	7448303	59%	/project
root	domain#root	131072	75315	55757	60%	/
www	domain#dbs	1000000	459421	540579	66%	/var/
www	domain#dbs	800000	3859736	2914064	67%	/var/
d0lc	domain#d0lc	124448200	84343068	39904892	69%	/d0lc
product	domain#product	17778192	11564750	6221442	71%	/usr/
www	domain#dbs	44445888	4110816	1578216	73%	/usr/
db	domain#db	10000000	7516411	2483559	76%	/db/
www	domain#dbs	35557304	28243806	7013418	81%	/d0lc
www	domain#dbs	44445888	7107913	1578216	82%	/usr/
backup	domain#backup	142228296	118233916	239994080	84%	/db/backup
scratch	domain#scratch	35557304	29782458	5622546	85%	/scratch
www	domain#dbs	44445888	9469664	1578216	86%	/usr/
online	domain#online	35557304	30708111	4437493	88%	/online
d0product	domain#d0product	14000000	13013417	965713	93%	/d0product
www	domain#dbs	44445888	21659972	1578216	94%	/usr/



User	Domain	Size	Used	Free	Percent	Mount Point
bu004	domain#bu004	71687348	80	71687268	0%	/buffer/bu004
bu007	domain#bu007	71687348	96	71687252	0%	/buffer/bu007
bu011	domain#bu011	71687348	96	71687252	0%	/buffer/bu011
bu012	domain#bu012	71687348	80	71687268	0%	/buffer/bu012
bu014	domain#bu014	71687348	96	71687252	0%	/buffer/bu014
bu015	domain#bu015	71687348	80	71687268	0%	/buffer/bu015
bu016	domain#bu016	71687348	80	71687268	0%	/buffer/bu016
bu019	domain#bu019	71687348	96	71687252	0%	/buffer/bu019
bu021	domain#bu021	71687348	96	71687252	0%	/buffer/bu021
bu022	domain#bu022	71687348	96	71687252	0%	/buffer/bu022
bu023	domain#bu023	71687348	96	71687252	0%	/buffer/bu023
bu024	domain#bu024	71687348	96	71687252	0%	/buffer/bu024
bu025	domain#bu025	71687348	96	71687252	0%	/buffer/bu025
bu026	domain#bu026	71687348	80	71687268	0%	/buffer/bu026
bu029	domain#bu029	71687348	96	71687252	0%	/buffer/bu029
bu030	domain#bu030	17778192	16	17778176	0%	/buffer/bu030
bu031	domain#bu031	17778192	16	17778176	0%	/buffer/bu031
bu032	domain#bu032	17778192	16	17778176	0%	/buffer/bu032
bu033	domain#bu033	71687348	104	71687244	1%	/buffer/bu033
bu034	domain#bu034	71687348	97	71687251	1%	/buffer/bu034
bu035	domain#bu035	71687348	97	71687251	1%	/buffer/bu035
bu036	domain#bu036	71687348	118	71687230	1%	/buffer/bu036
bu037	domain#bu037	71687348	96	71687252	1%	/buffer/bu037
bu038	domain#bu038	71687348	118	71687230	1%	/buffer/bu038



Monitoring – Big Brother





Web Servers

- There are several “internal” and “external” servers
 - ◆ Internal : visible only from within Online system
 - ◆ External : visible from anywhere
- One strategy is to mount / display from *same* disks
 - ◆ NFS mounted from a central server
 - ◆ Read-only mount to external servers
 - ◆ Appropriate ACL holes in router
 - ◆ Internal server:
 - ▲ <http://www-d0ol.fnal.gov> (alias for d0ol01)
 - ◆ External server:
 - ▲ <http://www-d0online.fnal.gov> (alias for d0online2)
- Other strategy is for server to act as client of internal node
 - ◆ Appropriate ACL holes in router
 - ◆ External server:
 - ▲ <http://www-d0l3mon.fnal.gov>



Control Room consoles

- Linux provides, by default, 6 serial and 1 graphical sessions
 - ◆ Graphical session is default
 - ◆ Switch among them with CTRL-ALT-F1 through CTRL-ALT-F7 keys
 - ▲ CTRL-ALT-F7 is the graphical session
- X is the windowing system for Linux
 - Ref: http://www.freebsd.org/doc/en_US.ISO8859-1/books/handbook/x11.html
 - ◆ As opposed to Windows, where X has to be run “on top of” the native windowing system
 - ◆ The windowing system is the function of the “X server”
 - ▲ `/etc/X11/X`
 - Configured by `/etc/X11/XF86config-4`
 - Sets properties of graphics cards and monitors
 - Manages the DISPLAYs
 - Restart with CTRL-ALT-BACKSPACE – logs you out!
 - ◆ The X “display manager” runs to manage graphical logins
 - ▲ `/usr/X11R6/bin/xdm`
 - ◆ The X “window manager” runs upon login; we use fvwm
 - ▲ `/usr/X11R6/lib/X11/fvwm2`
 - Configured to set virtual windows, menus, etc
 - Restartable “hot” from menu



Useful tools

- Check usage

top

P (default) to sort by CPU usage

M to sort by memory usage

*Overutilization of swap space
may indicate a memory leak
problem*

- Files, sockets, etc

lsof

-p <pid>

-i [udp,tcp]:<port>

*Gives a lot of information on
open files, network connections*

*(Tru64 nodes (d00la/b/c) first
require a 'setup lsof')*

- Check network connections:

netstat -a

- Check processes

ps [-lef]

ps -lfu <user name>

- Check memory utilization

vmstat [repeat period]

Can see swap I/O, local disk I/O



Common alarms

- Disk utilization
 - ◆ Questions to ask:
 - ▲ Is it a cluster or local disk?
Shared mount on d0ola / d0olb / d0olc
 - ▲ Is it a critical disk?
Cluster disks tend to be more important
 - ▲ Who's to blame?
“User disks” (/home, /mnt/group)
 - ▲ How fast is it filling?
Check periodically, or use “larrd” plots in Big Brother
- Memory utilization
 - ◆ Linux will try to utilize all the physical memory
 - ▲ Applications plus buffer cache
 - Use “free” to see the split
 - ▲ When physical memory exhausted, then swap space used
 - This can greatly degrade performance
 - ◆ Identify problematic applications